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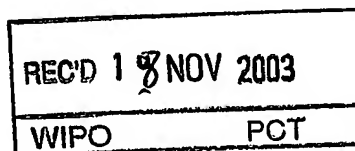
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Patentanmeldung Nr. Patent application No. Demande de brevet n°

02078672.9



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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:  
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LED string outdoor application

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LED assembly

EPO - DG 1

06. 09. 2002

(75)

The invention is related to an LED assembly provided with an LED and contact wires.

The invention further relates to a string of interconnected LED assemblies and to a plurality of thus formed strings.

In a string the LED assembly forms an LED repetition unit.

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#### Background of the invention.

The LED-technology offers specific advantages for applications: robustness, energy friendliness, operating at low voltage, and a long life. As a consequence products are being offered in the market, that can replace e.g. neon in the channel letter application. Known products are a.o. the LED Rail from LumiLeds, the LED channel letter solution from Osram and GelCore.

For many of the outdoor applications it is required that the lighting part is outdoor proof. As an example: the channel letters only give protection to direct water jets, but do not have an IP classification. At present these LED-based channel letter solutions are installed in outdoor channel letters, which causes failures related to corrosion of electrical contacts if no specific precautions are taken. More quality-concerned companies embed the products in epoxy, spray the electrical contacts with lacquers or apply IP 54 connectors to all the electrical contacts.

Depending on the chosen outdoor protection, different drawbacks exist:

\*embedding the products in epoxy: once the outdoor version has been prepared, it is impossible to adapt the lay-out of the lighting component, without causing damage to the system. Moreover, for the above-given example the epoxy is not only at the positions to embed and protect the connections, it is present at the complete bottom of the channel letters (spill of epoxy). Time-consuming, expensive approach.

\*spraying the electrical contacts with lacquers: low IP-class can be achieved, labour-intensive approach, of which the quality is completely depending on the accuracy of the worker

involved.

\*or apply IP 54 connectors to all the electrical contacts; only few contacts need to be of non permanent character. This means that this approach is expensive. Furthermore, if the IP classified connectors are not pre-installed in the lighting component, the approach is also labour-intensive, and therefore even more expensive. This approach is not tolerant with respect to the use of different types of LEDs.

#### Summary of the invention.

10 The proposal is to *package the LED containing repetition unit*, including the contacts of the wires that connect one repetition unit to the next one. As a consequence:

\*the amount of additional material for obtaining the outdoor proof version of the lighting component is limited;

\*this approach is being applied to permanent parts of the lighting component.

15 Only where non-permanent contacts are desired, IP 54 connectors will be applied. Therefore, the proposed approach can intrinsically be cheaper than the afore-mentioned approaches.

\*it is possible to use Printed Circuit Boards for electrical contacts. This is a standard and proven technology. Moreover, this approach is tolerant with the

20 use of different types of LEDs; cheap and low investments.

\*the product will be made outdoor proof at the production line, of which the quality can be set and controlled.

\*repetition units can be exchanged if necessary by cutting the contact wires, while keeping the other part of the lighting component intact.

25 When choosing a white, light scattering material for the package of the LED containing repetition unit, light absorption by the package will be of a reduced level only (customer wish).

\*it is still possible to change the spacing between the LED-boards by shortening, for instance through bending or cutting the contact wires or lengthening the contact wires by inserting an extra length of wire between successive LED repetition units.

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Preferably the light emitting part of the LED is kept outside the packaging as to prevent as much as possible any light loss.

The concept has been realized in the form of demonstrators, see the 2 pictures below with 2 different views of the demonstrators. In both pictures the upper LED string is the unprotected version, not suitable for outdoor use. The lower LED string is an example of the proposed approach: the LED string packaged in synthetic material (this case black).

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The proposed approach can be used for channel letters, but is not restricted to that application. Examples of other application areas are LED-based light lines for decorative or guiding purposes.

Suitable materials and methods of packaging are listed below.

Material	Manufacturing process
Thermoplast	Injection moulding
Thermosetter	Transfermolding
Castepoxy	Globtop / Casting
Casting resin (2-components)	Casting
Hotmelt	Dispensing
Glue	Dispensing
Combination Thermoplast - Epoxy	Casting of epoxy in thermoplastic encapsulation
Combination Foil-Epoxy	Vacuumshaping/cutting Glueing/casting epoxy Sealing

10

Preferably a string is formed by a repetition of LED assemblies separated from each other by a length of common contact wires. Typical dimensions of an LED assembly are 1cm wide, 2cm long. In height it may vary between several mm to over a cm. The assemblies are mounted in the string for instance on a separation of 5cm. As the contact wires are flexible the actual distance between successive LEDs in the final application can be varied according to wish. Such a string can be form to a roll or coil being advantageous for further handling. A string can for instance contain 1200 LED assemblies.

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In a further embodiment of the invention the LED assemblies are grouped for instance in a matrix of 3 parallel strings each with an own colour of the LED, preferable red, green and blue.

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Alternatively an LED assembly can contain more than 1 LED, for instance 3 LEDs of different colour.

A suitable base is for instance a printed circuit board (PCB). The PCB can hold besides the LED and the connections with the contact wire further electric components, like for instance

for current limiting. Suitable in this respect is for instance a resistor. In a further embodiment the components can be formed by electronics, possibly provided with intelligence. This is in particular interesting for purposes of light and/or colour control, like for instance dimming.

With the invented LED assembly it is possible to achieve at least a protection level according

5 to general accepted classification IP67.

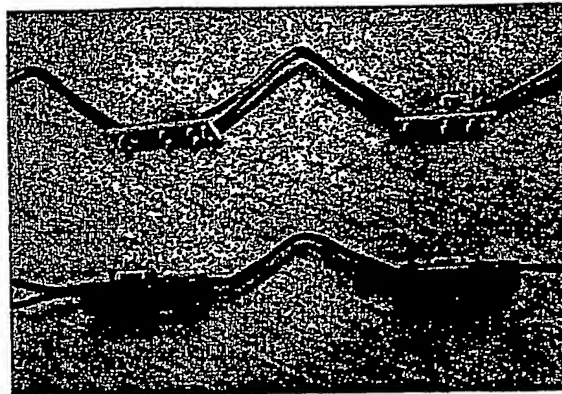
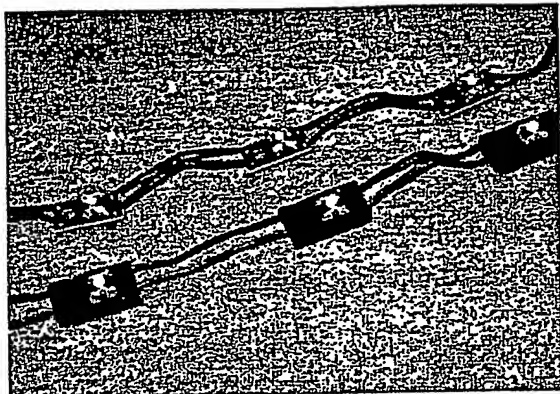
## Claims

06. 09. 2002

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- 1 LED assembly provided with an LED mounted on a base, which is provide  
5 with electric connection wires.
- 2 LED assembly according to claim 1 wherein the LED mounting and electric  
contacts to the connection wires are protected from the surroundings by a  
package.
- 10 3 LED assembly according to claim 1 wherein the assembly is provided with a  
protection according to at least IP54.
- 15 4 LED assembly according to claim wherein the assembly contains a plurality of  
LEDs.
- 5 LED assembly according to claim 1 wherein the assembly incorporates one or  
more electric components for local control.
- 20 6 A string formed by a plurality of LED assemblies as claimed in any preceding  
claim.
- 7 A string according to claim 6 wherein the LED assemblies are separated from  
each other by a length of common contact wires.
- 25 8 A plurality of strings each according to claim 6, which strings are arranged as  
forming a matrix

05.09.2002



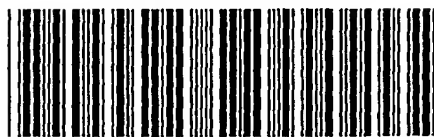
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PCT Application  
**IB0303829**



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